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Changing Profile of Major Ports of India

Ports play a pivotal role in India's economy, handling over 90% of merchandise trade by volume and supporting strategic and developmental priorities. However, inefficiencies and low productivity constrain trade competitiveness and economic growth. This paper examines total factor productivity growth in Indian ports, focusing on the Sagarmala programme. The findings indicate that although major ports have witnessed productivity improvements, there remains significant divergence in performance across ports since the programme's implementation.

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Ports are central to India's economy and play a critical role in its international trade, handling around 95% of the country's trade by volume and about 70% by value (PIB 2024b). Beyond trade, ports are also integral to the country's strategic priorities. At the time of independence, India had five major ports. At present, there are 13 major ports and 217 notified non-major ports along a coastline of 7,517 km. These ports constitute key nodes in global supply chains and are crucial to the growth of the Indian economy.¹

Indian ports have undergone a significant transformation over the past decade and a half. Port performance is a key determinant of a country's trade competitiveness. In recent years, as many as nine Indian ports have featured in the global top 100 of the Container Port Performance Index (CPPI) for 2023, including Visakhapatnam (19), Mundra (27), Pipavav (41), Kamarajar (47), Cochin (63), Hazira (68), Krishnapatnam (71), Chennai (80), and Jawaharlal Nehru (96).² These improvements reflect gains in operational efficiency and

service delivery in the handling of ships and cargo. The major ports have also exceeded cargo-handling targets in recent years. Such progress can be attributed to policy initiatives, including the National Maritime Development Programme (NMDP) and the Sagarmala programme. More recently, the Maritime India Vision (MIV) 2030 and Maritime Amrit Kaal Vision (MAKV) 2047 have outlined a longer-term strategy for the sector. This paper examines the performance of major ports with a focus on productivity.

Despite these achievements, concerns remain regarding the sustainability of development programmes, particularly in the context of India's trajectory towards Viksit Bharat@2047. The remainder of the paper is organised as follows. Initially, cargo profiles of major ports are discussed, followed by a discussion on their productivity performance. Subsequently, key features of maritime development programmes that have contributed to global recognition are outlined, along with major findings of the study and policy implications.

Cargo Profiles of Major Ports of India

The past decade and a half has been a critical phase in India's economic transformation, with ports identified as key enablers of growth. While the size of the Indian economy doubled from about \$1.5 trillion in 2010 to \$3 trillion in 2022, cargo throughput at major ports recorded only a moderate increase between 2010–11 and 2022–23 (Table 1, p 59). Despite overall economic expansion, port growth has remained subdued, reflecting underlying structural constraints. The total cargo handled by major ports rose from 570.09 million tonnes (MT) to 784.27 MT during this period, implying a compound annual growth rate (CAGR) of 2.7%.

Image

Table 1: Cargo and Container Profile of Major Ports of India

Major Ports	Cargo Handled			Container Traffic		
	2010–11	2022–23	CAGR	2010–11	2022–23	CAGR
	MT	MT	(%)	MT	MT	(%)
SMP Kolkata DS	35.00 (6.14)	17.05 (2.17)	-5.82	6.22	8.52	2.66
SMP Haldia DC	12.54 (2.2)	48.61 (6.2)	11.95	2.84	2.07	-2.60
Paradip	56.04 (9.83)	135.33 (17.26)	7.62	0.07	0.19	8.68
Visakhapatnam	68.04 (11.93)	73.75 (9.4)	0.67	2.57	8.46	10.44
Kamarajar	11.01 (1.93)	43.51 (5.55)	12.13		10.61	
Chennai	61.46 (10.78)	48.95 (6.24)	-1.88	29.42	28.37	-0.30
VO Chidambaranar	25.73 (4.51)	38.04 (4.85)	3.31	8.17	14.68	5.00
Cochin	17.87 (3.13)	35.26 (4.5)	5.83	4.42	9.99	7.03
New Mangalore	31.55 (5.53)	41.42 (5.28)	2.29	0.57	2.37	12.61
Mormugao	50.06 (8.78)	17.33 (2.21)	-8.46	0.22	0.03	-15.30
Mumbai	54.59 (9.58)	63.61 (8.11)	1.28	0.65	0.23	-8.29
JL Nehru	64.32 (11.28)	83.86 (10.69)	2.24	56.43	76.19	2.53
Deendayal	81.88 (14.36)	137.56 (17.54)	4.42	2.59	8.57	10.49
All ports	570.09	784.27	2.69	114.16	170.29	3.39

Port capacity of Kolkata and Haldia are combined, MT—million tonnes.

Figures in parenthesis indicate percentage share in total traffic in respective traffic categories at major ports.

Source: Authors' compilation from various editions of *Basic Ports Statistics of India*, Ministry of Ports, Shipping and Waterways (MoPSW).

Out of the total cargo handled by major ports, overseas cargo accounted for 76.4%, registering a growth of 9.3% in 2022–23 over 2021–22.³ A port-wise analysis shows that Paradip recorded the highest growth (16.6%), followed by SMP Haldia (13.4%) during this period.⁴ Deendayal port (erstwhile Kandla port) accounted for the highest share (17.5%) of total cargo handled by major ports in 2022–23 and has consistently retained the top position since 2010–11. In contrast, ports located in major urban centres such as Kolkata, Chennai, and Mumbai have experienced marginal or negative growth in traffic over time, indicating a gradual spatial diffusion of cargo movement.

Containerisation in India began in 1973 on a limited scale, with the establishment of interim container-handling facilities at Mumbai and Cochin ports. Since then, container traffic has increased steadily in line with the growing use of containers in international trade (Government of India 2024). Jawaharlal Nehru port (76.19 MT) continues to be the leading container port in the country, followed by Chennai (28.37 MT). In 2022–23, Jawaharlal Nehru port accounted for 53% of total container traffic in twenty-foot equivalent units (TEUs) and 44.8% in tonnage, underscoring its pre-eminent position.

Performance and Productivity of Major Ports of India

Globally, empirical evidence suggests that long-run economic growth is supported by sustained increases in total factor productivity (TFP),⁵ with improvements in labour and capital contributing to productivity gains. In the Indian context, several studies—De (2006), Monteiro (2010), Gaur et al (2011), Mandal et al (2016), Sinha and Bagodi (2019), Mitra et al (2021), Nanyam and Jha (2023)—identify low productivity and inefficiency as key constraints affecting port performance. Efficient and productive ports are thus critical for enhancing competitiveness and reducing international trade costs.⁶

A productive and efficient port system is often a prerequisite for successful growth strategies, particularly those driven by exports. In contrast, inefficient port operations can act as a constraint on growth. India's growth slowdown in

the past has been partly attributed to a decline in TFP.⁷ Several studies also suggest that the gains from early port reforms were partially offset by persistent inefficiencies in port performance.⁸

Port capacity at major ports increased substantially from 670.13 MT in 2010–11 to 1,597.59 MT in 2022–23 (Table 2). In contrast, port capacity utilisation declined sharply from 85% in 2000–01 to 49.01% in 2021–22, indicating the growing underutilisation of major port capacity in India.

Image

Table 2: Key Performance Indicators (KPIs) of Major Ports of India

Major Ports	Port Capacity			Turnaround Time		
	2010–11	2022–23	Change	2010–11	2022–23	Change
	MT	MT	(%)	Hours	Hours	(%)
SMP Kolkata DS	67.05	92.77	38.4	149.04	48.88	67.2
SMP Haldia DC				106.8	51.52	51.76
Paradip	76.5	289.75	278.8	185.52	46.27	75.06
Visakhapatnam	64.93	134.18	106.7	140.16	73.19	47.78
Kamarajar	31	91	193.5	66.72	45.26	32.16
Chennai	79.72	135	69.3	104.64	48.08	54.05
V O Chidambaranar	27.04	111.46	312.2	96	46.89	51.16
Cochin	40.98	78.6	91.8	52.8	39.45	25.28
New Mangalore	45.57	108.96	139.1	64.8	44.9	30.71
Mormugao	41.9	63.4	51.3	250.32	54.59	78.19
Mumbai	44.53	84	88.6	119.04	50.4	57.66
JL Nehru	64	141.37	120.9	63.36	28.27	55.38
Deendayal	86.91	267.1	207.3	141.6	77.58	45.21
All ports	670.13	1,597.59	138.4	126.96	51.48	59.45

Source: Authors' compilation from various editions of *Basic Ports Statistics of India*, MoPSW.

Average turnaround time (TRT), a key indicator of port performance measuring the time taken by a ship to enter, unload, load and exit a port, has improved significantly over the past two decades. TRT declined by about 60%, from around five days (126.96 hours) to nearly two days (51.48 hours) during this

period. In 2022–23, Jawaharlal Nehru port recorded the lowest TRT at about one day (28.27 hours), followed by Cochin and New Mangalore at approximately 1.5 and 2 days, respectively. Notable improvements are also observed in Mormugao and Paradip ports.

However, compared to countries such as the United States (US) and China, Indian ports are generally smaller, less efficient, and constrained by inadequate draft to handle larger vessels. Only two Indian ports—Jawaharlal Nehru port and Mundra—feature among the top 50 container ports globally, according to the World Shipping Council (Table 3, p 60). India also lags behind on key port performance indicators (KPIs) such as port capacity and average turnaround time relative to the US and China. The average container vessel size calling at Indian ports is about 5,000 TEUs, compared to around 12,000 TEUs in China.⁹

Image

Table 3: Indian Ports in Comparative Perspective

KPIs	India	China	US
Port capacity stock (per cent of GDP)	1	3	10
Number of shipyards*	7	70	45
Number of ports in global top 50	2	18	4
Container traffic (million TEUs)	11	185	44
Average annual growth in container traffic (million TEUs)**	0.5	10	0.4
Average turnaround time (days)	4.5	1	1.2

*Considers more than 120 m long ships; **For the period 2008–12.

Source: Authors' calculation from Sagarmala, National Perspective Plan and World Shipping Council.

Cargo handling at Indian ports has increased over the past two decades (Appendix 1, p 63). However, sustaining export momentum and enhancing competitiveness requires adequate and efficient port and maritime infrastructure. This raises the question of how effectively India's major ports, which handle 76% of overseas cargo, are equipped to manage trade flows. An

analysis of TFP helps assess the productivity of individual major ports and evaluate the potential impact of the Sagarmala programme on port productivity.

This study employs TFP and TFP growth (TFPG), estimated using a Cobb–Douglas production function, following De and Barman (2025).¹⁰ Data on traffic, capital and labour for Indian ports are drawn from various issues of *Basic Port Statistics of India*, published by the Ministry of Ports, Shipping and Waterways (MoPSW). For port-wise capital, year-wise capital employed (expenditure) is used and converted into real terms using a capital formation deflator. Labour comprises officers, non-cargo handling workers, cargo handling workers (shore and non-shore), casual workers, dock labour board workers and dock workers employed. Estimation across the pre-Sagarmala, post-Sagarmala and the overall period indicates decreasing returns to scale (homogeneity < 1) in all three phases (Table 4).

Image

Table 4: Predicted Average Values—TFP and TFPG

Major Ports	2000–01 to 2013–14		2014–15 to 2021–22		2000–01 to 2021–22	
	TFP	TFPG (%)	TFP	TFPG (%)	TFP	TFPG (%)
ChPA	1.26	-1.01	0.84	-2.08	1.21	-0.45
CoPA	0.47	-2.44	0.75	-2.56	0.53	0.96
DPA	1.77	-1.84	2.16	29.63	1.94	0.30
JNPA	1.57	2.08	1.55	-1.41	1.56	2.04
KPL	0.89	0.36	0.80	0.20	0.94	3.73
MbPA	0.96	-3.22	1.09	7.27	1.02	-0.21
MoPA	1.05	2.17	0.55	3.04	0.82	6.01
NMPA	1.02	-2.12	1.05	3.49	1.03	-0.76
PPA	1.16	5.84	2.44	7.61	1.66	6.76
SMP (HDC)	1.04	1.80	0.79	-0.97	0.96	3.04
SMP(KDS)	0.34	1.57	0.35	-4.00	0.34	1.09
VOCA	0.63	3.24	0.93	6.02	0.72	2.81
VPA	1.54	-4.71	1.38	3.69	1.51	-1.95
CV	0.4		0.54		0.42	

Source: Authors' estimation based on De and Barman (2025).

While analysing productivity and input efficiency, several alternative methods are available. Data Envelopment Analysis (DEA), a non-parametric linear programming approach, is widely used to assess the relative efficiency of decision-making units (DMUs) such as organisations, departments, or business units, based on multiple inputs and outputs. However, the Cobb–Douglas production function, a parametric method, provides direct estimates of output elasticities with respect to inputs. In contrast, DEA generates efficiency scores and peer comparisons but does not yield interpretable economic parameters governing input–output relationships. In this study, assessing the scale properties of the production function is essential for understanding input–output dynamics. This motivates the use of the Cobb–Douglas specification to estimate TFP and the TFPG, following De and Barman (2025).

The results indicate that, on average, TFPG accelerated in the post-Sagarmala period (2014–15 to 2021–22) compared to the pre-Sagarmala period (2000–01 to 2013–14).¹¹ During the pre-Sagarmala phase, Deendayal Port (DPA), Jawaharlal Nehru Port (JNPA), and Visakhapatnam Port (VPA) recorded the highest average TFP among major ports. In the post-Sagarmala period, Paradip Port (PPA), DPA and JNPA emerged as the leading performers. Overall, DPA, PPA and JNPA rank among the most productive major ports.

TFPG shows an overall increase following the launch of the Sagarmala programme. In the pre-Sagarmala period, seven ports recorded positive average TFPG, with the highest growth observed at PPA and V O Chidambaram Port (VOCA). In the post-Sagarmala period, eight ports registered positive average TFPG, with DPA recording the highest growth, followed by PPA. Over the entire period, nine ports exhibited positive average TFPG, with DPA leading in productivity, followed by PPA. Notably, Paradip Port demonstrates a consistent rise in productivity since 2000.

While major ports such as Paradip, Jawaharlal Nehru, and Deendayal have shown improvements in productivity following the implementation of the Sagarmala programme, others—such as SMP Haldia and SMP Kolkata—have not recorded similar gains. This suggests a widening divergence in productivity levels across major ports, as reflected in an increase in the coefficient of variation (CV) in the post-Sagarmala period.

India's Maritime Development Programmes

To further strengthen the maritime sector and scale up the development, India has introduced a series of initiatives, including the NMDP,¹² Sagarmala, MIV 2030, and MAKV 2047. Table 5 (p 61) outlines the objectives and key features of these programmes. A common emphasis across these initiatives is the enhancement of productivity in India's maritime sector.

Image

Table 5: India's Maritime Development Programme

Initiative	Primary Objectives
National Maritime Development Programme (NMDP) (2005–12)	<ul style="list-style-type: none">• To modernise port infrastructure through adding new cargo handling facilities, construction/upgradation of berths, deepening of channels, rail/road connectivity projects, equipment upgradation/modernisation schemes and other related schemes for creation of backup facilities• To benchmark the performance of ports to international standards
Sagarmala (2015–23)	<ul style="list-style-type: none">• To reduce logistics cost for both domestic and export–import cargo with minimal infrastructure investment• To implement projects for port modernisation, port connectivity, port-led industrialisation, coastal community development, and coastal shipping and inland water transport
India Maritime Vision 2030 (Introduced in 2021)	<ul style="list-style-type: none">• To strengthen India's position in the global maritime sector, MIV 2030 identifies over 150 initiatives across various maritime sub-sectors like ports, shipping and waterways• These initiatives particularly focus on operational efficiency improvement, port-driven industrialisation and creating safe and sustainable world-class ports to address the growing trade volume needs, as well as reducing logistics cost through better evacuation and cost-effective processes
Maritime Amrit Kaal Vision 2047 (Introduced in 2023)	<ul style="list-style-type: none">• The Amrit Kaal Vision 2047 builds on the MIV 2030 with an aim to develop world-class ports and promote inland water transport, coastal shipping, and a sustainable maritime sector• It encompasses aspirations in logistics, infrastructure, and shipping, supporting India's "Blue Economy" for enhancing ports, shipping, and waterways by 2047

Source: Authors' compilation based on various secondary sources.

One of the flagship initiatives of the MoPSW is the Sagarmala programme, which seeks to transform India’s maritime sector through a comprehensive development strategy. The programme involves project implementation through multiple funding mechanisms, including equity, grants-in-aid, internal resources, public–private partnership (PPP) modes, in collaboration with stakeholders such as central ministries, state maritime boards, major port authorities and state governments. The number of projects implemented under the PPP mode has increased over time, contributing to capacity augmentation, efficiency gains, productivity improvements and greater competition.¹³ In addition to PPPs, a significant number of projects are being executed through the internal resources and technical capabilities of MoPSW agencies (Table 6, p 61). Overall, 839 projects, with an estimated investment of ₹5.8 lakh crore, are planned under the Sagarmala programme by 2035. Of these, 262 projects (₹1.4 lakh crore) have been completed, 217 projects (₹1.63 lakh crore) are under implementation, and 360 projects (₹2.74 lakh crore) are under development.

Image

Table 6: Projects under Various Funding Arrangements in Sagarmala Programme

Funding Arrangements	No of Projects	Project Cost (₹ Crore)
PPP	121	2.4*
Equity	5	542
Internal resources	167	36,000
Grant in aid	176	11,700

*Unit is lakh crore.

Source: Authors’ compilation from <https://sagarmala.gov.in/>.

The programme is structured around five pillars and 24 categories. The pillar on port modernisation encompasses the development of new ports, modernisation of major and non-major ports, and ship repair facilities. A total of 166 projects, with an investment of ₹68,625 crore, are being implemented at major ports under this pillar. Of these, 90 projects (₹26,098 crore) have been completed, resulting in a capacity addition of over 230 MTPA. A further 38 projects, valued at ₹22,232 crore, have been awarded and are under implementation. Alongside capacity expansion, the MoPSW has focused on improving operational efficiency through mechanisation, digitisation and process simplification. As a result, key efficiency indicators have shown notable improvement in the last five years.¹⁴

Conclusions and Policy Implications

The observed acceleration in productivity following the implementation of the Sagarmala programme suggests that investments in infrastructure development have yielded positive outcomes, as reflected in improved productivity levels across major ports. Deendayal, Jawaharlal Nehru, and Paradip emerge as the three topmost productive ports, having consistently performed well on KPIs since 2010.

To sustain this momentum, the MIV 2030 and MAKV 2047 propose several initiatives, including upgrading Deendayal and Paradip ports to deep-draft port facilities and developing them as green hydrogen and ammonia hubs under the National Hydrogen Mission (PIB 2024a). Financial performance also reflects these gains: Paradip port reported a net surplus of ₹1,570 crore (\$188 million), marking a 21% increase, while Jawaharlal Nehru port recorded a net surplus of ₹1,263.94 crore (\$151 million) in 2023 (PIB 2024b). Further, the Union Budget 2025–26 has proposed a ₹25,000 crore Maritime Development Fund (MDF) to support the maritime sector through equity and debt financing. With 49% government contribution, the remaining contribution is expected from major ports, other public entities, financial institutions and private

players. The MDF aims to increase the share of Indian-flagged vessels to 20% of global cargo by 2047, reduce foreign dependence, and enhance strategic and economic resilience. It is expected to mobilise investment up to ₹1.5 lakh crore in the shipping sector by 2030.

Apart from the government's continued emphasis on improving port productivity, there is a need for caution regarding emerging inequalities in productivity gains across major ports. This calls for targeted augmentation of capital and technology in ports that are lagging behind. In particular, the union government should prioritise the allocation of resources to ports performing poorly on key productivity indicators. Alongside central efforts, port authorities must continue to prioritise investments in port infrastructure, including berths, cargo-handling equipment, and hinterland connectivity, in order to sustain the observed momentum. Policy interventions should also focus on addressing port-specific bottlenecks, such as infrastructure constraints, operational inefficiencies, and skill gaps.

Policies should be designed to promote the adoption of advanced technologies, such as automation and artificial intelligence (AI), to further enhance port productivity. For instance, the use of AI in port analytics can enable real-time monitoring of port KPIs, thereby facilitating more informed policy decisions. A separate port-wise plan for technological upgradation should be formulated and closely monitored. Port authorities must also prioritise skill development and training programmes for dock workers to ensure that they possess the requisite competencies to operate modern equipment and handle increasingly complex cargo operations.

By 2030, India's annual port capacity is projected to exceed 3,000 MT. Achieving this target will require greater involvement of the private sector, alongside active guidance and engagement by the government. The landlord port model is effective only when port operation and services are managed by private operators. Further, enhanced centre–state coordination in the

maritime sector is essential for fostering comprehensive and inclusive development. In this context, strengthening the Maritime State Development Council (MSDC) in the short run could facilitate more integrated and coordinated growth of both major and non-major ports, in close collaboration with state governments, union territories, and central agencies.

Notes

1 Sahai (1986): Discusses the role played by ports in the post-independence period.

2 World Bank (2024): “Regional Disruptions Drive Changes in Global Container Port Performance Ranking,” <https://www.worldbank.org/en/news/press-release/2024/06/01/regional-disruptions-drive-changes-in-global-container-port-performance-ranking>.

3 Ministry of Ports, Shipping and Waterways (2023): *Basic Port Statistics 2022–23*.

4 See note 3.

5 Solow (1957); Griliches and Jorgenson (1967); Kendrick and Vaccara (1980); Klenow and Rodriguez-Clare (1997); Hall and Jones (1999); van Ark (2000); Dieppe (2021).

6 Goldar and Paul (2018): Argue that improved port efficiency enhances the competitiveness of India’s manufactured exports, enabling Indian manufacturing firms to export more.

7 Ahluwalia (1991); Virmani (2004); Goldar (2022); Goldar et al (2023).

8 De (2006); see also Virmani and Hashim (2011), who attribute the post-reform decline in productivity to technological obsolescence.

9 Ministry of Ports, Shipping and Waterways (MoPSW), <https://shipmin.gov.in/>.

10 De and Barman (2025), <https://www.ris.org.in/index.php/en/node/4041>.

11 See Appendix 2 (p 63) for trends in total factor productivity (TFP) and its growth across major ports.

12 PIB, <https://pib.gov.in/newsite/PrintRelease.aspx?relid=133484>.

13 Ministry of Ports, Shipping and Waterways: *Public Private Partnerships (PPP) in Maritime Sector, Maritime Amrit Kaal Vision 2047*.

14 Sagarmala programme: “Port Modernisation,” <https://sagarmala.gov.in/project/port-modernization>.

References

Ahluwalia, I J (1991): *Productivity and Growth in Indian Manufacturing Sector*, Delhi: Oxford University Press.

De, Prabir (2006): “Total Factor Productivity Growth: Indian Ports in the Era of Globalisation,” *Maritime Economics & Logistics*, Vol 8, pp 366–86.

De, Prabir and Arpit Barman (2025): “Assessing Performance and Productivity of Major Ports of India,” RIS Discussion Paper No 300, Research and Information System for Developing Countries (RIS), New Delhi.

Dieppe, A (ed) (2021): *Global Productivity: Trends, Drivers, and Policies*, Washington, DC: World Bank.

Gaur, P, P Shivani and S Tarun (2011): “Ports Face Inadequate Capacity, Efficiency and Competitiveness in a Developing Country: Case of India,” *Maritime Policy & Management*, Vol 38, No 3, pp 293–314.

Goldar, Bishwanath and Mahua Paul (2018): “Impact of Port Infrastructure Development and Operational Efficiency of Ports on Export Performance: A Study of Manufactured Product Exports from India,” paper presented at the 14th Annual Conference on Economic Growth and Development, 19–21 December, Indian Statistical Institute, New Delhi.

Goldar, B (2022): “Did Trade Liberalization Boost Total Factor Productivity Growth in Manufacturing in India in the 1990s?” *International Productivity Monitor*, Vol 43, pp 110–39.

Goldar, B, S K Chattopadhyay, S Nath, S Sengupta and P C Das (2023): “Determinants of Total Factor Productivity Growth in India,” *Theoretical Economics Letters*, Vol 13, pp 683–718.

Government of India (2024): *Basic Port Statistics of India*, New Delhi: Ministry of Ports, Shipping and Waterways, Transport Research Wing.

Griliches, Zvi and Dale W Jorgenson (1966): “Sources of Measured Productivity Change: Capital Input,” *The American Economic Review*, Vol 56, pp 50–61.

Hall, R E and C I Jones (1999): “Why Do Some Countries Produce So Much More Output per Worker than Others?” *Quarterly Journal of Economics*, Vol 114, No 1, pp 83–116.

Klenow, P J and A Rodriguez-Clare (1997): “The Neoclassical Revival in Growth Economics: Has It Gone too Far?” *NBER Macroeconomics Annual*, Vol 12, pp 73–103.

Kendrick, J W and B N Vaccara (1980): “Introduction to ‘New Developments in Productivity Measurement,’” *New Developments in Productivity Measurement*, Chicago: University of Chicago Press, pp 1–44.

Mitra, S, Pritam Banerjee, S Atul, P Mayank and G Dhruv (2021): “Reforming Port Processes in India for Logistics Efficiency,” Asian Development Bank, Manila.

Mandal, Anindita, Soma Roy Chowdhury and Jhumoor Biswas (2016): “Performance Analysis of Major Ports in India: A Quantitative Approach,” *International Journal of Business Performance Management*, Vol 17, No 3, pp 345–64.

MoPSW (2021): *Maritime India Vision 2030*, Ministry of Ports, Shipping and Waterways, Government of India, New Delhi.

— (2024): *Maritime Amrit Kaal Vision 2047*, Ministry of Ports, Shipping and Waterways, Government of India, New Delhi.

Monteiro, J G R (2010): “Measuring Productivity and Efficiency of Major Ports of India,” *Economic & Political Weekly*, Vol 45, Nos 26–27, pp 325–31.

Nanyam, V P S N and Neeraj Kumar Jha (2023): “Modeling Challenges Affecting the Performance of Major Ports of India,” *Asian Journal of Shipping and Logistics*, Vol 39, No 3, pp 26–38.

PIB (2024a): *Maritime Amrita Kaal Vision 2047*, <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2080010>.

— (2024b): *Sagarmanthan 2024: India’s Maritime Vision*, Press Information Bureau, Government of India, <https://pib.gov.in/PressNoteDetails.aspx?NoteId=153432&ModuleId=3®=3&lang=1>.

Sahai, Baldeo (1986): *The Ports of India*, Ministry of Information and Broadcasting, Government of India, New Delhi.

Sinha, Deepankar and Virupaxi Bagodi (2019): “A Causal Review of Dynamics in Indian Ports,” *IIM Kozhikode Society & Management Review*, Vol 8, No 1, pp 60–73.

Solow, Robert M (1957): “Technical Change and the Aggregate Production Function,” *Review of Economics and Statistics*, Vol 39, pp 312–20.

van Ark, H H (2000): *Economic Growth and Labour Productivity in Europe: Half a Century of East–West Comparisons*, Groningen Growth and Development Center, Groningen.

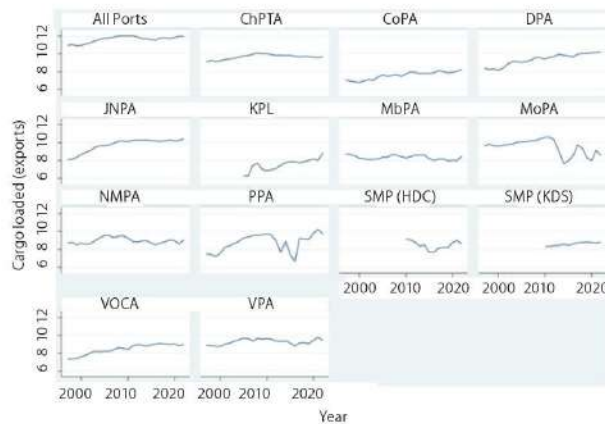
Virmani, A (2004): “Sources of India’s Economic Growth: Trends in Total Factor Productivity,” ICRIER, New Delhi.

Virmani, A and M D A Hashim (2011): *J-Curve of Productivity and Growth: Indian Manufacturing in Post-liberalization*, International Monetary Fund, Washington, DC.

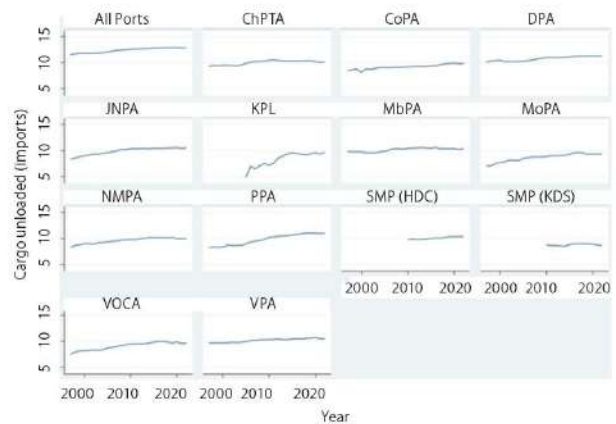
Image

Appendix 1

Overseas Cargo Loaded and Unloaded by Major Ports from 2000 to 2022



Log adjusted value of cargo exported (Cargo loaded) at specified ports
 *Cargo loaded (overseas), port-wise, 1997–2023.
 Disaggregated data for Kolkata ports (SMP-HDC and SMP-KDS) are available only from 2010 onwards.
 Source: Authors' compilation based on *Basic Port Statistics of India*.

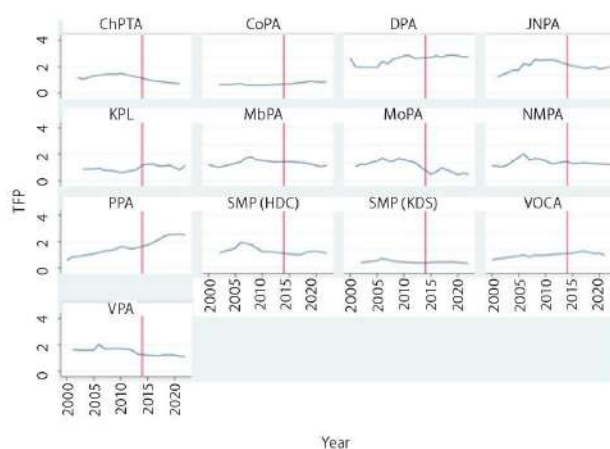


Log adjusted values of Cargo imported (Unloaded)
 Cargo unloaded (overseas), port-wise, 1997–2023.
 Disaggregated data for Kolkata ports (SMP-HDC and SMP-KDS) are available only from 2010 onwards.
 Source: Authors' compilation based on *Basic Port Statistics of India*.

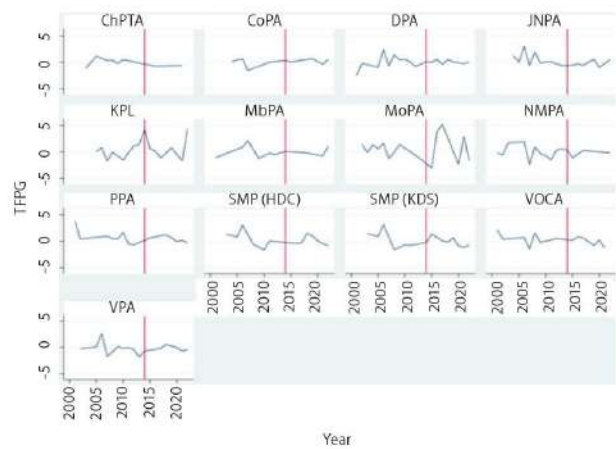
Image

Appendix 2

Trends in TFP and TFFPG for the Period 2000–22



Trends in total factor productivity of the ports for the whole period (2000–22).
 Source: Authors' own estimation from *Basic Ports Statistics of India*.



Trends in growth in total factor productivity of the ports.

Source: <https://www.epw.in/journal/2026/17/special-articles/changing-profile-major-ports-india.html>